

**WHAT IS CLAIMED IS:**

1. A sensor for sensing the pressure of a first fluid, comprising:
  - a housing;
  - an optical waveguide based sensing element disposed in the housing;
  - a buffer fluid disposed in the housing and in fluid communication with the sensing element;
  - a pressure transmitter coupled to the housing for maintaining a predefined relationship between pressures of the first and buffer fluids;
  - a connector assembly coupled to the housing; and
  - an optical waveguide coupling the sensing element to the connector assembly.
2. The sensor of claim 1, wherein the housing further comprises:
  - an inner shell coupled to the transmitter assembly and partially defining a sensing chamber having the sensing element and at least a portion of the buffer fluid disposed therein.
3. The sensor of claim 2, wherein the inner shell is radially electron beam welded to the transmitter assembly.
4. The sensor of claim 2, wherein the housing further comprises:
  - an outer shell disposed over the inner shell and coupled to the transmitter assembly and a connector assembly.
5. The sensor of claim 4, wherein the outer shell is radially electron beam welded to the transmitter assembly and the connector assembly.
6. The sensor of claim 4, wherein the sensing element is supported within the housing in a cantilevered orientation.
7. The sensor of claim 2, further comprising:
  - at least one guard coupled to the sensing element and adapted to prevent the sensing element from contacting the inner shell.

8. The sensor of claim 7, wherein the guard is configured to allow buffer fluid to pass between the guard and the inner shell.
9. The sensor of claim 1, further comprising:
  - a guide disposed in the housing between the sensing element and the connector assembly, wherein the guide allows a serpentine length of fiber to pass therethrough.
10. The sensor of claim 1, further comprising:
  - a hollow sleeve disposed in the housing and having the optical waveguide passing therethrough;
  - a plurality of crimps formed in the sleeve creating restricted diameter sections within the sleeve; and
  - an adhesive disposed in the sleeve.
11. The sensor of claim 1, the pressure transmitter further comprises;
  - a buffer tube having a first end fluidly coupled to a port adapted to allow the first fluid to enter the sensor and a second end disposed within the housing, the buffer tube at least partially filled with buffer fluid.
12. The sensor of claim 11, wherein the buffer tube further comprises:
  - an inner row of coils and a second row of coils, wherein the second row of coils has a greater diameter than the first row of coils.
13. The sensor of claim 11, wherein the buffer tube is wound in a toroid.
14. The sensor of claim 1, wherein the sensing element further comprises a Bragg grating sensor.
15. The sensor of claim 14, wherein the Bragg grating sensor comprises a large diameter optical waveguide.

16. The sensor of claim 14, wherein the Bragg grating sensor comprises an optical fiber.
17. The sensor of claim 1, wherein the sensing element is coated with at least one layer of a water diffusion resistant material.
18. The apparatus of claim 17, wherein the diffusion resistant material is selected from the group consisting of chrome, gold, silver, carbon and silicon oxide.
19. A sensor for sensing the pressure of a first fluid, comprising:
  - a housing having a sensing chamber;
  - an optical waveguide based sensing element disposed in the housing and supported within the sensing chamber in a cantilevered orientation;
  - a buffer fluid disposed in the housing and in fluid communication with the sensing element; and
  - a pressure transmitter coupled to the housing for maintaining a predefined relationship between pressures of the first and buffer fluids.
20. The sensor of claim 19, further comprising:
  - at least one guard coupled to the sensing element and adapted to prevent the sensing element from contacting the housing.
21. The sensor of claim 19, wherein at least one of the guards is configured to allow buffer fluid to pass between the guard and the housing.
22. The sensor of claim 19, further comprising:
  - a connector assembly coupled to the sensing element by an optical cable.
23. A sensor for sensing the pressure of a first fluid, comprising:
  - a housing having a sensing chamber and a fluid port;
  - an optical waveguide based sensing element disposed in the housing;
  - a buffer fluid disposed in the housing and in fluid communication with the sensing element; and

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Attorney Docket No.: WEAT/0542

Express Mail No.: EV335469945US

a buffer tube disposed in the housing coupled between the fluid port and the sensing chamber, the buffer tube at least partially filled with the buffer fluid, the buffer tube includes at least one of:

an inner row of coils and a second row of coils, wherein the second row of coils has a greater diameter than the first row of coils; and  
toroidal coil.

24. The sensor of claim 23, further comprising:  
a connector assembly coupled to the sensing element by an optical cable.